CLAIMS

1. A Raman amplifying device for amplifying signals with wavelengths λ_{S1}, λ_{S2} ... λ_{Sn} comprising an optical path, pump sources for generating a plurality of Raman pump signals for backward pumping and means for coupling the plurality of Raman pump signals into the optical path, wherein the plurality of optical Raman pump signals are time-division multiplexed by multiplexing controlling means characterized in that the controlling means multiplex the pumps in time so that a noise at a wavelength λ_{S1} or λ_{S2} or ... λ_{Sn} that co-propagates with the pump do not experience high variations of gain in time.

2. A Raman amplifying device according claim wherein the controlling means multiplex the pumps in time so that none of the noises at wavelength λ_{S1} and λ_{S2} and ... λ_{Sn} that co-propagates with the pump experiences high variations of gain in time.

3. A Raman amplifying device for amplifying signals with wavelengths λ_{S1}, λ_{S2} ... λ_{Sn} comprising an optical path, pump sources for generating a plurality of Raman pump signals for backward pumping and means for coupling the plurality of Raman pump signals into the optical path, wherein the plurality of optical Raman pump signals are time-division multiplexed by multiplexing controlling means wherein the time-division multiplexing frequency is higher than the minimal corner frequency f_C of the co-propagating pump-to-signal modulation transfer function among the co-propagating pump-to-signal modulation transfer functions that implicate the signals and the pumps:

$$f_C = MIN_{i,j}\left\{\frac{\alpha_{Pi}}{2\pi\left|\frac{1}{V_{Sj}} - \frac{1}{V_{Pi}}\right|}\right\}$$

where V_{Sj} and V_{Pi} are the group velocities of the signal Si and the Raman pump signal Pi, α_{Pi} is the attenuation of the fiber at the pump wavelength λ_{Pi}.

4. A Raman amplifying device for amplifying signals with wavelengths λ_{S1}, λ_{S2} ... λ_{Sn} comprising an optical path, pump sources for generating a plurality of Raman pump signals for backward pumping and means for coupling the plurality of Raman pump signals into the optical path, wherein the plurality of optical Raman pump signals are time-division multiplexed by multiplexing controlling means wherein the controlling means multiplex the pumps in time so that the pumps that give significant gain to a signal Sk and the pumps that do not give significant gain to the signal Sk are alternated in time at a frequency that is higher than the minimal corner frequency f_C of the co-propagating pump-to-signal modulation transfer function among the co-propagating pump-to-signal modulation transfer functions that implicate the signal Sk and the pumps ~~P_N~~-that give significant gain to Sk:

$$f_C = MIN_i\left\{\frac{\alpha_{Pi}}{2\pi\left|\frac{1}{V_{Sk}} - \frac{1}{V_{Pi}}\right|}\right\}$$

where V_{Sk} and V_{Pi} are the group velocities of the signal Sk and the Raman pump signal Pi, α_{Pi} is the attenuation of the fiber at the pump wavelength λ_{Pi}.

5. Raman amplifying device according claim 4 wherein the controlling means multiplex the pumps in time so that the pumps that give significant gain to a signal Sk and the pumps that do not give significant gain to the signal Sk are alternated in time at a frequency that is higher than the maximal corner frequency f_C of the co-propagating pump-to-signal modulation transfer function among the co-propagating pump-to-signal modulation transfer functions that implicate the signal Sk and the pumps that give significant gain to Sk:

$$f_C = MAX_i\left\{\frac{\alpha_{Pi}}{2\pi\left|\frac{1}{V_{Sk}} - \frac{1}{V_{Pi}}\right|}\right\}$$

6. Raman amplifying device according claim 4 wherein
the controlling means multiplex the pumps in time so that the conditions expressed for Sk are fulfilled for all the signals Sk, k=1 to n.

7. Raman amplifying device according claim 5 wherein

the controlling means multiplex the pumps in time so that the conditions expressed for Sk are fulfilled for all the signals Sk, k=1 to n.

8. A Raman amplifying device according claim 3 to 7 with a fiber wherein this fiber has a reduced corner frequency of the co-propagating modulation transfer functions.

9. Method for time multiplexing a plurality of Raman pump signals in a amplifying device for amplifying signals with wavelengths λ_{S1}, λ_{S2} ... λ_{Sn} comprising an optical path, pump sources for generating a plurality of Raman pump signals for backward pumping and means for coupling the plurality of Raman pump signals into the optical path, wherein the plurality of optical Raman pump signals are time-division multiplexed by multiplexing controlling means comprising by the step:
multiplexing the pumps in time so that a noise at a wavelength λ_{S1} or λ_{S2} or ... λ_{Sn} that co-propagates with the pump do not experience high variations of gain in time.

10. Method according claim 9 comprising the step:
multiplexing the pumps in time so that none of the noises at wavelength λ_{S1} and λ_{S2} and ... λ_{Sn} that co-propagates with the pump experiences high variations of gain in time.